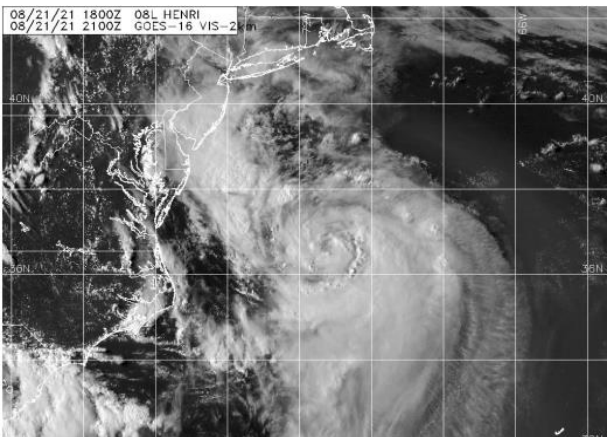
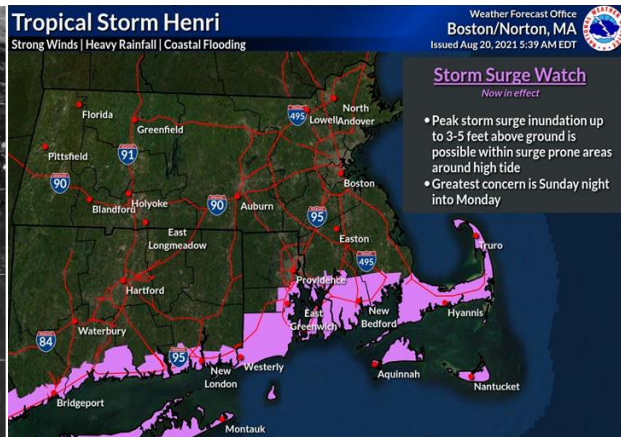


# Welcome to the Southern New England Hurricane Tabletop Exercise NWS Forecast Services!

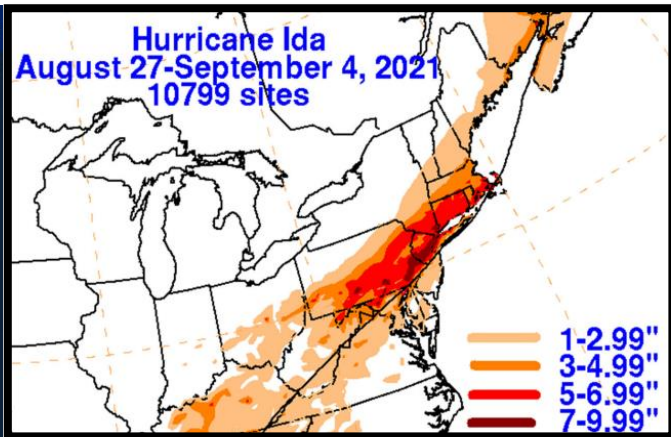
**Frank M. Nocera**  
Impact-based Decision Support Services Lead  
NOAA/NWS Weather Forecast Office, Boston/Norton, MA



Hurricane Henri approaching southern New England, 21Z August 21<sup>st</sup> 2021



1<sup>st</sup> Storm Surge Watch issued for southern New England - Tropical Storm Henri, August 20th 2021



Observed rainfall from Hurricane Ida, August 27-September 4, 2021



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# Overview of Today's Activities

- Welcome and opening remarks
  - NHC Director Ken Graham
  - Introductions of our participants
- Introduction of the exercise and review of select products to be used
- Introduce framework for the day:
  - Five time steps, each led off by NWS Briefing
  - Group discussion following 1<sup>st</sup> advisory, breakouts used for remaining time steps



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# Ken Graham – Director, National Hurricane Center

## Welcome & Remarks



### NHC Mission:

- Our People (Who We Are) - a team of science, technical and administrative specialists dedicated to our mission and vision
- Mission (Why We Exist) - to save lives, mitigate property loss, and improve economic efficiency by issuing the best watches, warnings, forecasts and analyses of hazardous tropical weather, and by increasing understanding of these hazards.
- Vision (What We Hope to Achieve) - to be America's calm, clear and trusted voice in the eye of the storm, and, with our partners, enable communities to be safe from tropical weather threats.



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# Introductions

- Name (just lead representative from each agency)
- Organization/Emergency Response Responsibility



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# Detailed Outline for Today

- Introduction of the exercise and review of select NHC products to be used (30 min)
- Introduce framework for the day: (10 min)
  - 5 Time steps, each led off by NWS Briefing
  - Group discussion following 1<sup>st</sup> advisory, breakouts used for remaining
- Advisory 1 (20 min)
  - Briefing by NWS (5 min)
  - Group discussion (15 min)
- Advisory 2 (35-40 min)
  - Briefing (5 min NWS)
  - Breakouts (20-25 min)
  - Brief report outs from room facilitators (10 min)
- Repeat sequence for Advisories 3 through 5
- Hot wash and online feedback/assessment



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# Today's Agenda

- Overview of the latest NHC/NWS product suite (it's changed a lot since the last landfalling hurricane – Bob 1991)
- Introduction to these services you will use in this exercise
  - *You're the first group in our office history to collaborate in a TTX with the states of MA, RI & CT, along with NWS entities NHC, WPC, NWC & NERFC and federal partners (FEMA, USACE & USCG)!*
- Conduct the exercise based on the approach of Hurricane Thompson



Storm surge flooding, Cliff Walk in Newport, RI following Hurricane Sandy, October 2012

Photo: Alexander Nesbitt



Inundation & erosion, Westerly, RI

Photo: Lauren Butler



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# Our Goals For This Exercise

- Give you the opportunity to use new & existing forecast services
- Gather your feedback
  - What are your first thoughts when you see these products/services?
  - Is this information helpful?
  - What other information do you need?
  - Do these predictions look reasonable?
- Learn how you would use these services to prepare for wind/power outages, river flooding & storm surge/coastal inundation
  - What decisions would you be making?
  - Who would you be coordinating with?
  - What resources do you need?
  - How can the NWS help you?



Before & during a home in Menauhant, MA.  
Photos: courtesy of Doc Taylor



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**So why are we doing this?**  
**Two reasons:**

**#1: Our products & services have changed drastically since our last landfalling hurricane (Bob, 1991)**

**Are there any gaps in service?**



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# So why are we doing this?

#1: Our products & services have changed drastically since our last landfalling hurricane (Bob, 1991)

**#2: Gain experience. The last time we helped the emergency management community of MA with coastal evacuations was 1996 – Hurricane Edouard**



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# Why are we doing this?

*#1: Our product suite has changed drastically!*

## Storm Surge Watch/Warning Services

- First came online in 2017
  - Providing general information on potential storm surge yielding significant inundation
  - Watch timeline – 36 to 48 hours
  - Warning timeline – 24 to 36 hours
- First issuance for southern New England was Aug 2021 for Tropical Storm Henri

## Keep in mind

- Lead time is critical in preparation (accelerating storm?)
- Know your evacuation zones – who will you evacuate & how long will it take (clearance times)?

### Tropical Storm Henri

Strong Winds | Heavy Rainfall | Coastal Flooding

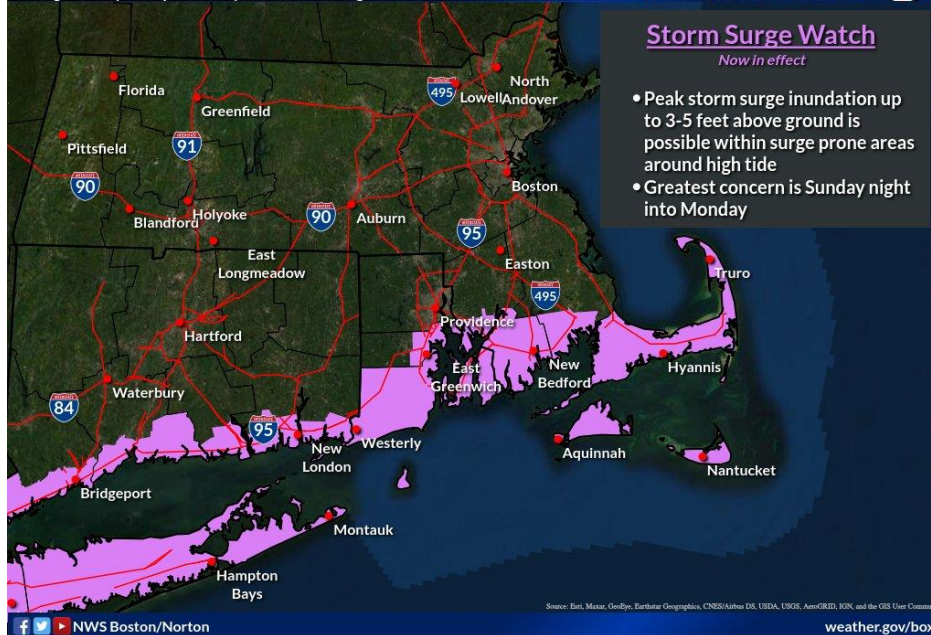
Weather Forecast Office  
Boston/Norton, MA  
Issued Aug 20, 2021 5:39 AM EDT



#### Storm Surge Watch

Now in effect

- Peak storm surge inundation up to 3-5 feet above ground is possible within surge prone areas around high tide
- Greatest concern is Sunday night into Monday



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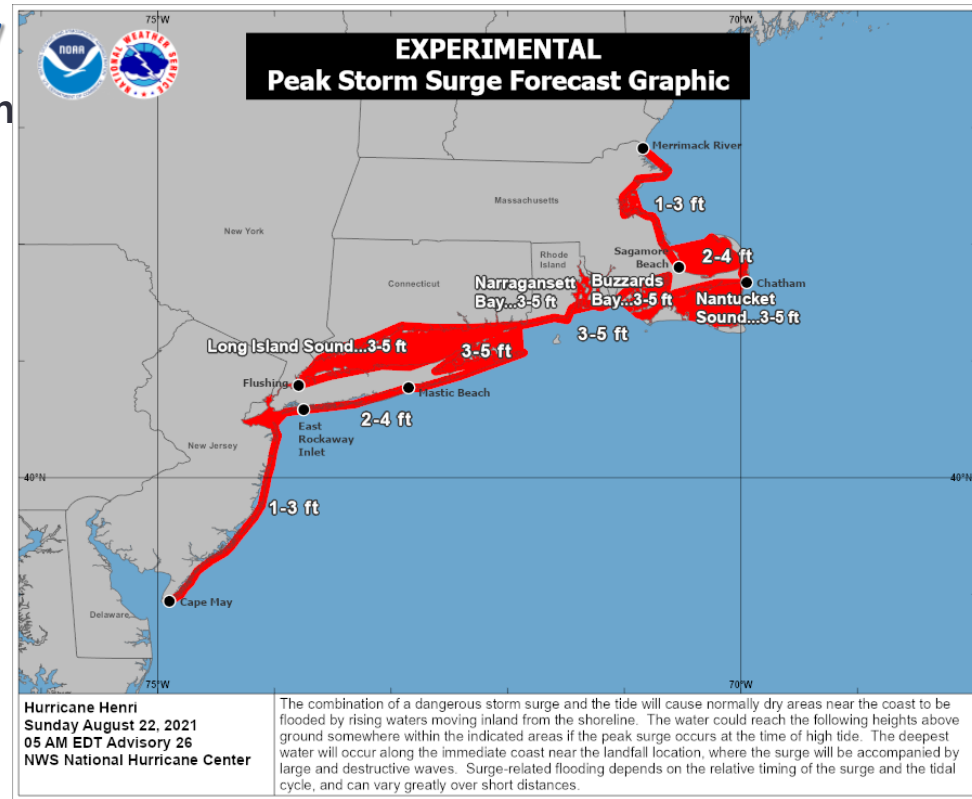
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# Why are we doing this?

#1: *Our product suite has changed drastically!*

## EXPERIMENTAL – Peak Storm Surge Inundation Forecast Graphic

- First came online in 2017
    - Provides potential inundation if peak storm surge coincides with high tide
    - Don't add these values to astro tide
    - Displays inundation as **above ground level** (AGL)
    - Reasonable worst case, scenario designed with safety in mind (covers 90% of scenarios – 10% exceedance guidance)
    - Issuance timeline – out to 48 hours
  - First issuance for southern New England was Aug 2021 for Tropical Storm Henri
- Keep in mind**
- Are these values uniform throughout the coastline?



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# Why are we doing this?

*#1: Our product suite has changed drastically*

## NHC High Resolution GIS Based Inundation Mapping

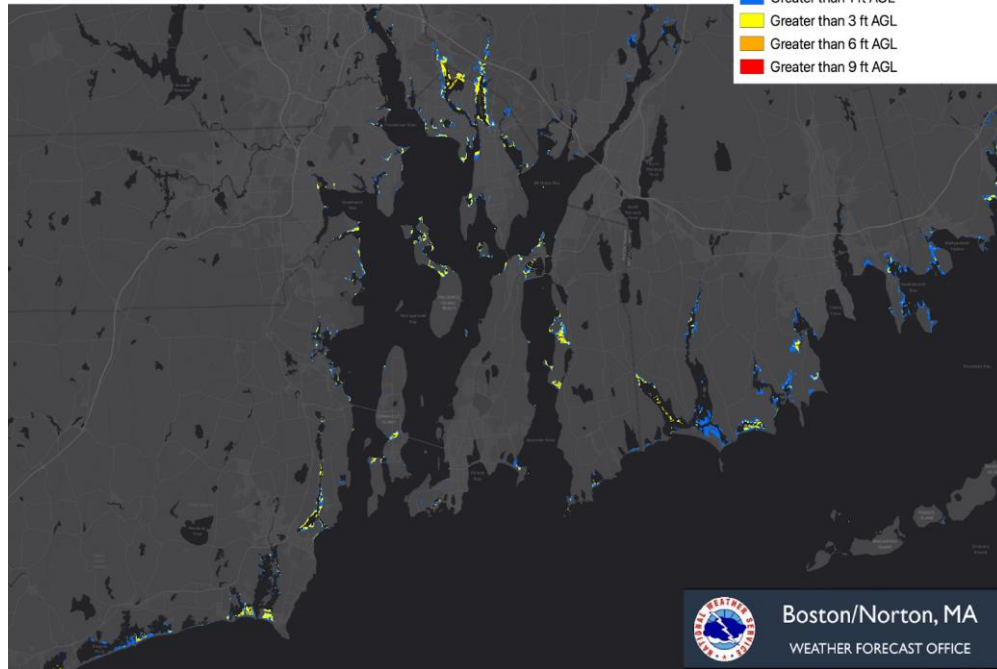
- First came online in 2017
  - Provides greater detail of potential inundation
  - Clearly indicates inundation will vary
  - Use with caution, as the shape/configuration of the coastline changes with each storm
  - Timeline – out to 48 hours
  - ***This is where local knowledge is very important***
- First issuance for southern New England was Aug 2021 for Tropical Storm Henri

Potential Storm Surge Flooding Map

NHC Potential Storm Surge Flooding Map  
Hurricane Henri (2021) Advisory 24  
From 5 PM EDT Saturday August 21

Potential Storm Surge Flooding\*

0 to 1 ft AGL  
Greater than 1 ft AGL  
Greater than 3 ft AGL  
Greater than 6 ft AGL  
Greater than 9 ft AGL



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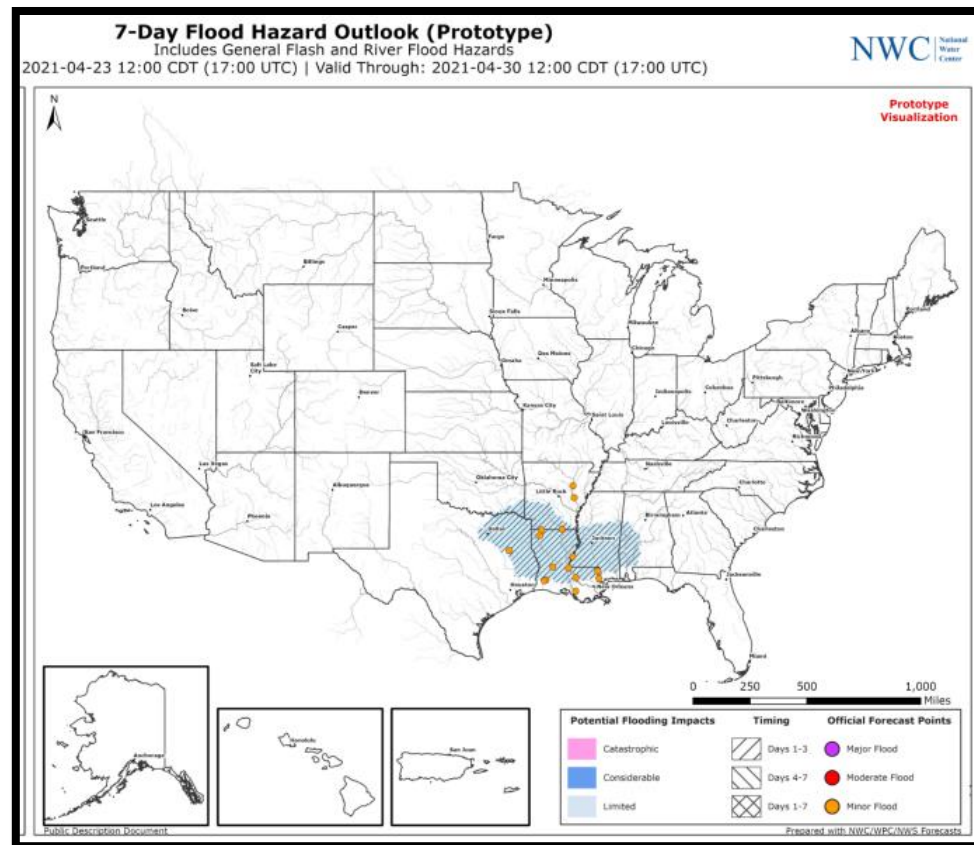
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# Why are we doing this?

*#1: Our product suite has changed drastically!*

## Flood Hazard Outlook (Prototype)

- First came online 6/1/2021
  - Highlights the general flash and river flood threat hazards basin over the next 7-days.
- Issued twice a day
- A collaborative effort between NWC, WPC & RFCs
- Flood Threat Categories
- **Limited**: Flash flooding and/or minor river flooding is expected
- **Considerable**: Significant flash flooding and/or moderate/major river flooding is expected
- **Catastrophic**: Exceedingly rare and widespread flash flooding and/or river flooding is expected



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# Why are we doing this?

*#1: Our product suite has changed drastically!*

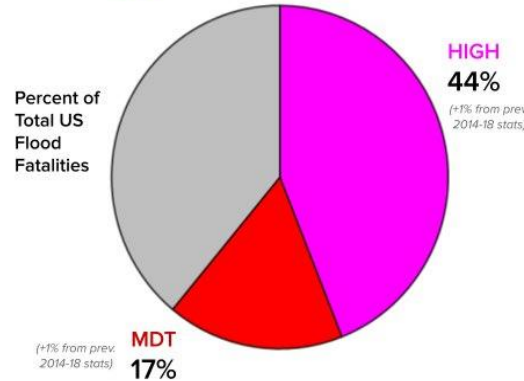
## Excessive Rainfall Outlook



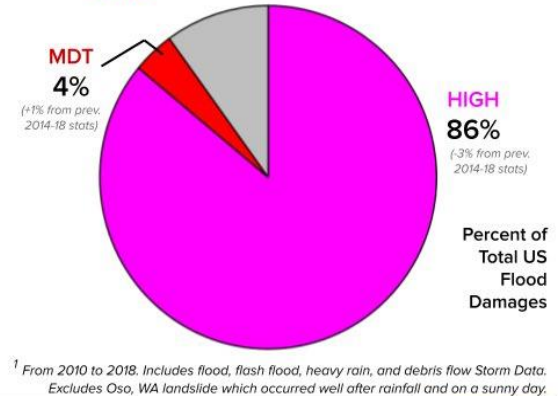
## WPC High Risk Days are a **BIG DEAL**

High Risks are only issued by WPC on ~4% of days, but “High Risk Days” have accounted <sup>1</sup> for:

**2/5** of ALL Flood-related **Fatalities**



**9/10** of ALL Flood-related **Damages**



<sup>1</sup> From 2010 to 2018. Includes flood, flash flood, heavy rain, and debris flow Storm Data. Excludes Oso, WA landslide which occurred well after rainfall and on a sunny day.



WEATHER PREDICTION CENTER  
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION



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# An Outline of Today's Exercise

- Tabletop is divided into five time steps leading up to the approach of hurricane Thompson on Labor Day Monday, Sep 5<sup>th</sup>, 2022
- Each time step will begin with a formal NWS Weather Briefing
  - Emulating exactly what we would provide you in a real event
- You will then go into breakout rooms for 15-25 minutes to review the wind, rainfall, river flooding & storm surge/inundation forecasts & answer questions pertaining to the forecast services and decisions you may be considering in preparation for weather impacts
- Return to the large group for discussion then repeat for next timestep



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# Some Breakout Logistics

- Breaking folks up into groups:
  - Public Safety, infrastructure & facilities (FEMA, USCG & USACE)
  - State EOCs (MA-RI-CT)
  - NWS entities
- We have NWS facilitators in each of the rooms
- We will provide a set of questions for you to consider as you review the data



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# Please bookmark the following website for today's exercise:

- Tabletop Exercise Website
  - [\*\*\*https://www.weather.gov/box/sne\\_tabletop\*\*\*](https://www.weather.gov/box/sne_tabletop)
  - Provides links to the main presentation, questions, WFO Weather/Hurricane Briefings and all products/services we are providing today



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# Active participation during break outs

- There is no single solution to any of the questions we ask
- Dialogue encouraged, this a safe, open, stress-free environment
- ***Tremendous inter-agency coordination needed to ensure an effective response***
- What are some of the significant issues this scenario presents you and how can our products & services assist in your decision making?



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# ARE WE READY?



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# Time Step # 1: 5 pm Thursday, September 1st

- Services:
  - NHC track, wind forecasts including probabilities & timing
  - WPC rainfall forecasts & excessive rainfall outlooks
  - NWC Flood Hazard Outlook (FHO)
- Questions to consider:
  - MEMA, RIEMA & CT DEMHS - Begin media relations messaging to the public?
    - Is the messaging targeted to vulnerable populations (e.g. populations in flood/wind zones, underserved populations)?
  - Any consideration to situational awareness messages or beginning to schedule planning meetings based on this forecast?
  - Does anything get activated to prepare for the next day? How do you communicate to your staff not tuned into the weather to be aware of the hurricane potential? Anyone returning from leave in the days ahead?



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# Time Step # 2: 5 pm Friday, September 2<sup>nd</sup>

- Services:
  - NHC track, wind forecasts including probabilities & timing
  - WPC rainfall forecasts & excessive rainfall outlooks
  - NWC Flood Hazard Outlook (FHO)
  - NERFC river hydrographs
- Questions to consider:
  - Based on storm track and rainfall forecasts, any thoughts on potentially conducting/deploying flood (river flooding) mitigation efforts?
  - Moving assets to safer locations (river/small stream flooding)?
  - Hurricane impacts 84-96 hrs. out, activate state EOCs?
  - States – based on current forecast, should we begin to reference evacuation zone maps?
  - What actions are local municipalities implementing per their Local Emergency Operations Plans (LEOP's)?
  - Will Federal support be needed? Will any contracts need to be activated?



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# 10 MINUTE BREAK



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# Time Step # 3: 5 pm Saturday, September 3rd

- Services:

- NHC track, watches, **storm surge**, wind forecasts including probabilities & timing
- WPC rainfall forecasts & excessive rainfall outlooks
- NWC Flood Hazard Outlook (FHO)
- NERFC river hydrographs

- Questions to consider:

- 72-84 hours to hurricane landfall, hurricane watch in effect. States – should we begin to reference evacuation zone maps
- Any actions required for the three hurricane barriers (Stamford, CT – Providence/Fox Pt, RI & New Bedford, MA)?
- Are external capabilities being considered, or is contractor support being planned, or engaged for additional capability and support?



# Time Step # 4: 5 am Sunday, September 4th

- Services:

- NHC track, warnings, storm surge, wind forecasts including probabilities & timing
- WPC rainfall forecasts & excessive rainfall outlooks
- NWC Flood Hazard Outlook (FHO)
- NERFC river hydrographs

- Questions to consider:

- Any considerations for closing Cape Cod bridges soon?
- CT & RI, any considerations to closing portions of I-95 due to coastal flooding & high winds?
- Coordination with rail services? Amtrak, MBTA, commuter rail, MetroNorth (New Haven line), etc.,
- Coordination with USCG regarding ports closures?



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# Time Step # 5: 5 pm Sunday, September 4th

- Services:
  - NHC track, warnings, storm surge, wind forecasts including probabilities & timing
  - WPC rainfall forecasts & excessive rainfall outlooks
  - NWC Flood Hazard Outlook (FHO)
  - NERFC river hydrographs
- Questions to consider:
  - If requested by the states, Army Corps of Engineers representatives present at state EOCs?
  - All public transportation in CT, RI & MA suspended?
  - Under what circumstances would you consider closing operations at your facility?
  - Have evacuation recommendations been issued by the Governor?
  - Are the state High Hazard or Highly vulnerable dams being monitored?



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# Time for our Hot Wash!

- Discussion and evaluation of each agency's performance
- Top three (3) organizational strengths
- Top three (3) items requiring improvement



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# Please complete the assessment *now* at the following url -

[https://www.weather.gov/box/sne\\_tabletop](https://www.weather.gov/box/sne_tabletop)

- Your answers will help guide the improvement and implementation of new & existing services!
- We will be compiling an after action report incorporating your suggestions and input
- ***Follow-up actions to address the inevitable weak links - identify and address procedural/policy/technical adjustments before the real storm puts everyone to the test!***

## ***Thank you for your participation!***



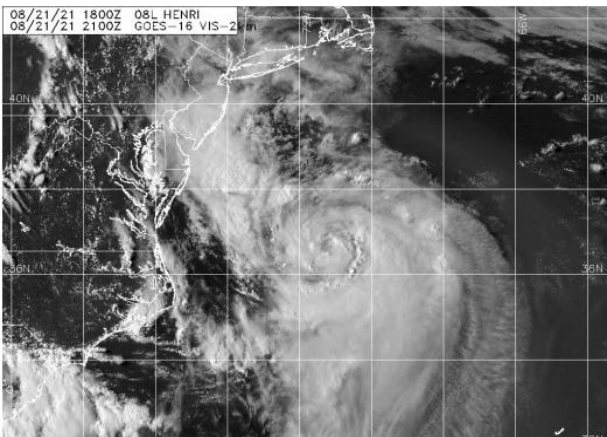
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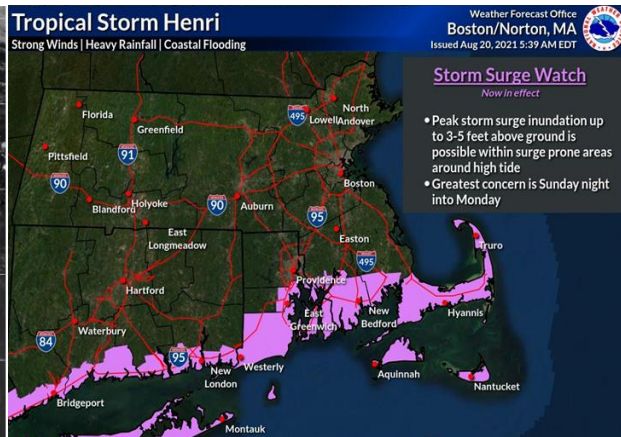
<http://weather.gov/box>  
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# Welcome to the Southern New England Hurricane Tabletop Exercise NWS Forecast Services!

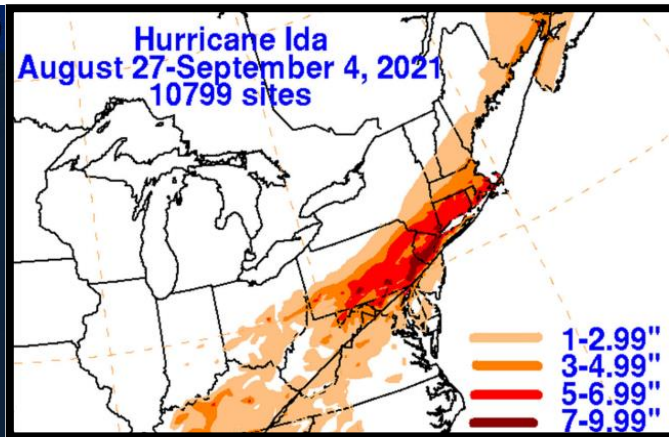
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Hurricane Henri approaching southern New England, 21Z August 21<sup>st</sup> 2021



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Observed rainfall from Hurricane Ida, August 27-September 4, 2021



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